

FILED

AUG 21 2014

CLERK, U.S. DISTRICT COURT
DISTRICT OF NEVADA
BY _____ DEPUTY

UNITED STATES DISTRICT COURT
DISTRICT OF NEVADA

NICOLE THOMPSON,)
)
Plaintiff,)
)
vs.)
)
TRW AUTOMOTIVE U.S. LLC.,)
)
Defendant.)

Case 2:09-CV-1375-JAD-PAL

DATED: August 21, 2014

COURT'S EXHIBIT

(REPORT OF DR. E. RAPHAEL USED DURING PROFFER BY MR. TIPPETTS

Delta V Biomechanics

930 Commercial Street
Palo Alto, CA 94303

Telephone: (650) 320.8800
FAX: (877) 819.1969

October 28, 2010

Jeff Golub
Beck, Redden & Secrest, L.L.P.
One Houston Center 1221 McKinney St.
Suite 4500
Houston TX 77010

David Tippetts
Weinstein, Tippetts & Little L.L.P.
7660 Woodway, Suite 500
Houston TX 77063

RE: Thompson v Autoliv and TRW

Dear Mr. Golub and Mr. Tippetts:

Introduction

This report summarizes the results of my investigation carried out to date in the above-referenced litigation. The following sections provide descriptions of the crash, review the injuries to the plaintiff, and present the analysis of the crash. My opinions are stated to a reasonable degree of engineering and medical certainty. My education, experience and training relative to the opinions set forth in this report are outlined in my curriculum vitae, which is attached to this report. My testimony history is also attached as an appendix. My associates and I are charging our standard rates for this case. Delta V Biomechanics currently charges \$550/hour for my services.

Materials Received and Reviewed

The following list describes case materials that were received and reviewed. The bibliography includes technical literature reviewed in conjunction with this matter.

Legal Documents

Plaintiff Thompson

- Complaint for Damages
 - Complaint 07-10-07
 - First Amended Complaint for Damages
 - Second Amended Complaint for Damages
- Admissions (and Admissions with Corollary Request for Documents)
 - Responses to Defendant Las Vegas Paving Corporation's Requests for Admission

Thompson v Autoliv

October 28, 2010

- Responses to Defendant, Daimler/Chrysler, LLC's First Set of Requests for Admissions and Corollary Request for Production of Documents
- Plaintiff Shirley Thompson's Responses to Defendant, Daimler/Chrysler, LLC's First Set of Requests for Admissions and Corollary Request for Production of Documents
- Production of Documents
 - Plaintiff Dennis Thompson's Responses to Defendant Daimler/Chrysler's First Set of Document Requests
 - Plaintiff Nicole Thompson's Responses to Defendant Daimler/Chrysler's Second Set of Document Requests
 - Plaintiff Nicole Thompson's Supplemental Responses to Defendant Daimler/Chrysler's First Set of Request for Admissions and Corollary Request for Production of Documents
 - Plaintiff Nicole Thompson's Supplemental Response to Defendant Daimler/Chrysler's First Set of Document Requests
 - Plaintiff Nicole Thompson's Response to Defendant Daimler/Chrysler's First Set of Document Requests
 - Responses to Defendant Las Vegas Paving Corporation's Requests for Production of Documents
- Interrogatories
 - Responses to Defendant Las Vegas Paving Corporation's First Set of Interrogatories
 - Answers to Defendant Daimler/Chrysler's First Set of Interrogatories
 - Supplemental Answers to Defendant Daimler/Chrysler's First Set of Interrogatories
 - Plaintiff Dennis Thompson Answers to Defendant Daimler/Chrysler's First Set of Interrogatories
 - Plaintiff Nicole Thompson's Answers to Defendant Daimler/Chrysler's Second Set of Interrogatories
- Early Case Conference Production Documents and Identification of Witnesses
 - First Supplement
 - Second Supplement
 - Third Supplement
 - Fourth Supplement
 - Fifth Supplement
 - Sixth Supplement
- Initial Disclosures
 - Initial Disclosure of Expert Witnesses
 - Initial Disclosure of Expert Witnesses with Exhibit 6

Plaintiff Thompson (in Thompson et al. v Autoliv et al.)

- Complaint for Damages
 - Amended Complaint 03-09-10
- Documents
 - First Responses to TRW's First Request for Production of Documents
 - Responses to Defendant Autoliv's First Set of Document Requests
 - Responses to Autoliv's First Set of Document Requests, Including Supplemental Responses by Nicole Thompson
- Interrogatories
 - D. Thompson's Responses to TRW Interrogatories

Thompson v Autoliv

October 28, 2010

- Nicole Thompson's Responses to TRW Interrogatories
- Shirley Thompson's Responses to TRW Interrogatories
- Disclosures
 - Rule 26(a)(1) Initial Disclosure
 - Exhibit 6 to Initial Expert Disclosure
 - First Supplement to Their Rule 26(a)(1) Initial Disclosure
 - Second Supplement to Their Rule 26(a)(1) Initial Disclosure
- Plaintiff's 2nd Supplemental Discovery Log (Exhibits 103-123)
[REDACTED]
- Answer to Plaintiff's Complaint
- Admissions
 - Responses to Plaintiff's First Set of Requests for Admissions
 - Amended Responses to Plaintiff's First Set of Requests for Admissions
 - Responses to Plaintiff Shirley Thompson's First Set of Requests for Admissions
- Documents
 - Response to Plaintiff's First Set of Document Requests
 - Responses to Plaintiffs' Second Set of Document Requests
 - Supplemental Response to Plaintiffs' First Set of Document Requests, Request Nos. 15, 16, and 33
- Interrogatories
 - Responses to Plaintiff's First Set of Interrogatories
 - Supplemental Response to Plaintiffs' First Set of Interrogatories, Interrogatory No. 9
- First Supplemental Report
- Initial Disclosure Statement
 - First Supplemental Disclosure
 - Second Supplemental Disclosure
 - Third Supplemental Disclosure
 - Fourth Supplemental Disclosure

Defendant Las Vegas Paving

- Early Case Conference Production of Documents and Witnesses
- First Supplement to 16.1 List of Witnesses and Documents
- Responses to First Set of Documents Requests
- Answers to First Set of Interrogatories
- Defendant Las Vegas Paving's response to RFP
- Las Vegas Paving Corporation Traffic Control Plans

Defendant Autoliv ASP Inc

- Initial Disclosures, Rule 26(A)(1)
- Objections and Responses to Plaintiffs' First Request for Production

Defendant TRW

- Initial Disclosures, Rule 26(A)(1)
- Objections and Responses to Plaintiffs' First Request for Production

Other

- Scheduling Order
- Stipulated Non-Party Protective Order 02-25-10
- Stipulated Non-Party Protective Order Signed 08-30-10
- Stipulated Amended Discovery Plan and Scheduling Order
- Stipulation and Order for Dismissal with Prejudice as to Defendant Eusebio Villatuya
- Third Stipulated Amended Discovery Plan and Scheduling Order
- Index of Plaintiffs' Document Production (Thompson v Autoliv, 417.037)
- Discs (CD or DVD)
 - AV00001-AV00413
 - BSKP CDs 025637, 025638, 025639, 025640, 025641, 025642
 - CGLLC008206- BSP 025692-027938 & BSP 028007-029290
 - CGLLC008207-BSP027939-028006
 - CGLLC 008205- BSKP 000001-001771 & BSKP 003072-025632
 - THO 1499 Diagnostic CD from Axiom Imaging (DOS: 7/02/09)
 - THO1400 of CT Angiogram (12/05/07) from Spring Valley Hospital Medical Center
 - THO1401 of CT Angiogram (4/27/07) and CT Thoracic Spine w/o Contrast (4/27/07) from University Medical Center
 - THO1402 of CT Brain w/o Contrast (6/25/07) from University Medical Center
 - THO1403 of CTA Abdomen (4/27/07) from University Medical Center
 - THO1404 of CTA Chest (4/27/07) from University Medical Center
 - THO1405 of MRI Low Joint Right (5/02/07) and ER Knee (5/09/07) from University Medical Center
 - THO1406 of CTA Neck (4/27/07) from University Medical Center
 - THO1407 of CT Brain w/o Contrast (4/27/07) from University Medical Center
 - THO1408 of CT Brain w/o Contrast (4/27/07), TR Chest Portable (4/27/07), TR Hand Limited (Right) (4/27/07), and TR Spine Cervical Trauma (4/27/07) from University Medical Center
 - THO1409 of CT Cervical Spine and CT Brain w/o Contrast (4/27/07) from University Medical Center
 - THO1410 of CT Spine w/o Contrast (4/27/07) from University Medical Center
 - THO1411 of ULT Carotid Doppler (5/02/07), Chest portable (5/02/07), MRI Brain w/o Contrast (4/29/07), TR Knee (4/28/07), TR Chest portable (4/28/07), and CT Brain w/o Contrast (4/28/07) from University Medical Center
 - THO1412 of MRI Brain w/o Contrast (5/09/07) and MRA Head w/o Contrast (5/09/07) from University Medical Center
 - THO1413 of CT-CTA Neck (12/31/08), MRI Brain w/ Contrast (12/31/08), MRA Neck w/ Contrast (12/31/08), and MRI C-Spine w/o Contrast (12/31/08) from University Medical Center
 - THO1414 of MRI L-Spine w/o Contrast (12/31/08), ULT Carotid Doppler (12/29/08), and CT Scan Brain (12/29/08) from University Medical Center
 - THO1415 of TR CT Brain (4/27/07), TR Chest portable (4/27/07), TR Hand Limited (Right) (4/27/07), and TR Spine Cervical (4/27/07) from University Medical Center
 - THO1416 of TR CT Cervical Spine w/o Contrast (4/27/07) from University Medical Center
 - THO1417 of TR CTA Neck (4/27/07) from University Medical Center

Thompson v Autoliv

October 28, 2010

- THO1418 of CD of TR CT Lumbar Spine w/o Contrast (4/27/07) from University Medical Center
- THO1419 of TR CT Brain w/o Contrast (4/28/07), SP Angio Carotid Cerebral BIL SI (4/27/07), MRI Brain w/o Contrast (4/27/07), and SP Angio Carotid Cervical BIL SI (4/27/07) from University Medical Center
- THO1420 of ULT Carotid Doppler (5/02/07), Chest Portable (5/02/07), MRI Brain w/o Contrast (4/29/07), TR Knee 1 or 2 Views (Right) (4/28/07), and TR Chest Portable (4/28/07) from University Medical Center
- THO1421 of MRA Head w/o Contrast (5/09/07), ER Chest 2 Views (Routine) (5/09/07), CT Scan Brain w/o Contrast (5/09/07), ER Knee 1 or 2 Views (Right) (5/09/07), MRI Low Joint Right w/o Contrast (5/02/07) from University Medical Center
- THO1422 of ULT Carotid Doppler (12/29/08), CT Brain w/o Contrast (12/29/08), BT Abdomen 2 Views (7/16/08), BT Spine Cervical Complete (5/20/08), CT Scan Brain (6/25/07), ER Shoulder 2 Views (6/25/07), and MRI Brain w/o Contrast (5/09/07) from University Medical Center
- THO1423 of TR CT CTA Neck (5/10/07) from University Medical Center
- THO1424 of CT CTA Neck (12/31/08), MRI w/o Contrast (12/31/08), MRA Neck w/o Contrast (12/31/08), MRI C-Spine w/o Contrast (12/31/08), and MRI L-Spine w/o Contrast (12/31/08) from University Medical Center
- CD: 139. UMC CD CT CTA Neck x2 THO 3365-3367
- CD: 142. UMC-CD MRI & CT Lumbar, OR lumbar x-rays THO 3377- 3381
- CD: 143. UMC CD MRI Brain w w/o and w/o studies THO 3382-3389
- CD: 146. ct brain 4/27/07-1/3/10 THO 3396-3405
- Desert Radiologists THO 3287
- Nevada Imaging Centers Exam Date- 12-02-09
- Nevada Imaging Centers Exam Date: 04-02-10
- Sunrise Hospital Diagnostics THO 3204 CD 1 of 2
- Sunrise Hospital Diagnostics THO 3204 CD 2 of 2
- Sunrise Hospital Radiology Films
- UMC CD MRA head w w/o Neck x2 THO 3360-3364
- UMC-CD Abdomen 2 view, Chest x6, C-spine x2, r shoulder, r knee x2, r hand, THO 3408-3422

Police Records

- State of Nevada Traffic Accident Report

Vehicle Information

- CARFAX Vehicle History Reports
- Vehicle Information Detail Report
- 1998 Dodge Neon Owner's and Service Manual
- Chrysler Engineering Standards
 - Air Bag Electronic Control Module Engineering Standard
 - Driver Air Bag Module Assembly Engineering Standard
- Chrysler Corporation Compliance Procedure
- Chrysler warning information

Thompson v Autoliv

October 28, 2010

- Compliance Report for FMVSS 208 (Dynamic Testing Performance)
- Vehicle and Component "Corporate Safety" and "Government Regulatory" Requirements
- Insurance records of Nicole Thompson

Fact Witness Depositions

- HUNT, Shawn 03-18-09
- KIISKILA, Franklin 08-26-10
- RICE, Corey 03-18-09
- ROCHELLE, Jeffrey 08-27-10
- THOMPSON, Dennis Craig 06-16-10
- THOMPSON, Nicole
 - 03-11-09, with exhibits
 - 06-16-10 with video deposition CD
- THOMPSON, Shirley Alice 06-16-10
- VILLATUYA, Eusebio 02-04-08, with exhibits
- WHIPPLE, Jeff (Officer) 03-18-09

Expert Witness Items

Reports

- BENEDICT, Charles 04-20-09
- BERG, Kerry 04-22-09 disclosure
- BERMAN, Alan 06-30-09 disclosure
- BRANTMAN, Russell
- CARUSO, Chris 04-19-09 disclosure
- CASSIDY, Michael
- KLIMA, Michael
- ORNER, Peter 07-11-08 disclosure
- PALENIK, Skip
- ROSS, Staci disclosure
- SELCO, Scott 04-14-09 disclosure
- STEPHENS, Greg
- WAHL, Thomas 04-01-09 disclosure and report

Reports (Thompson et al. v Autoliv et al.)

- STEPHENS, Greg preliminary report 10-21-10

Photographs and Inspections

- BENEDICT, Charles VI and EI photographs 03-13-09
- BERG, Kerry
 - VI photographs 04-01-08, 06-09-08
 - SI photographs 06-16-09
- CARUSA, Chris VI and EI photographs
- CASSIDY CD of vehicle inspection photographs
- CEB seat belt demonstration
- DRE sled demonstration
 - Photographs 06-09-10

Thompson v Autoliv

October 28, 2010

- o Supplemental Photographs 06-09-10
- KLIMA, Mike
 - o VI photographs 03-19-09
 - o Exemplar vehicle, subject vehicle comparison photograph 06-10
 - o EI photographs 06-02-10
 - o Dodge Neon Frontal Impact Demonstration Test Report and Video
- MARSH, Greg CD of photographs 04-23-08
- STEPHENS, Greg
 - o VI photographs 03-13-09
 - o SI DVD 03-19-08
 - o VI photographs 06-09-08
- ORNER, Peter
 - o EI photographs 06-08-08
 - o KM testing photographs 06-09-08
 - o VI photographs 06-09-08
- OSTREM vehicle inspection 06-09-08 and 06-10-08
- Scene and Vehicle Photographs Produced by Plaintiff
 - o 235 Color Photographs of Crash Scene and Dodge Neon
 - o 11 Color Photographs of Pills Found in Dodge Neon
 - o 9 Color Photos of Nicole Thompson's Injuries
 - o Photographs from Plaintiff

Medical Records of Nicole Thompson

- Allergy and Asthma Associates
- AMR
- Anthem PT
- Axiom Imaging
- Beech Street, no records found notice
- Boulder Family Practice
- Cardiovascular Surgery of Southern Nevada
- Center for Applied Neuroscience
- Comprehensive Cancer Center
- Dar Stone, P.A.
- Deseret Radiologists
- Deseret Women's Health
- Desert Radiologists
- Doctors Medical Services
- Dougal Morrison, MD
- Dr Luis Mortillaro re: Dennis Thompson
- Dr. Andrea Pernell
- Dr. Bess Chang
- Dr. Brian Lemper
- Dr. Christopher Rhee, M.D.
- Dr. German
- Dr. Goll
- Dr. Hyson
- Dr. John Martinez, M.D.

Thompson v Autoliv

October 28, 2010

- Dr. John Reneau
- Dr. Lippmann
- Dr. Louis Mortillaro re: Dennis Thompson
- Dr. Mark Kabins
- Dr. Mark Sylvain
- Dr. Morton Hyson
- Dr. Patel, billing
- Dr. Son Monivirin, no records found notice
- Dr. Stuart Kaplan, M.D.
- Dr. Timothy Sauter, no records found notice
- EMS Report, Las Vegas Fire and Rescue
- Escallate LLC Records, billing records
- Frederick Lippmann, MD
- Generations OB-GYN
- Harmony Healthcare re: Shirley Thompson
- HealthSouth Rehabilitation
- Horizon Ridge, Statement of no records
- L&M Footwear, employment records
- Las Vegas Fire and Rescue
- LMC Pathology
- Matt Smith Phyiscal Therapy
- MedEquip
- Mountain View Hospital, notice of no records available
- Nevada Imaging
- Nevada State College Records
- Orthopaedic Institute of Henderson
- Orthopedic Specialists, G. Mark Sylvain, M.D.
- PBS Anesthesia
- Plaintiff's response to RFP
- Prosthetic Center of Excellence
- Quest Diagnostics
- Radiology Films (11)
- R. Leon, MD
- Rite Aid Corporation
- Rite Aid Records
- Saraiya Billing Records
- Singer Billing Records
- Speech Therapy, affidavit of no records
- Spring Valley Hospital
- St. Rose Dominican
- Staci Ross, Ph.D.
- Summit Medical Group, no records
- Sunrise
- T. Sodor, physical therapy
- Teamster's Records
- Tim Soder Physical Therapy and Sports Rehab

Thompson v Autoliv

October 28, 2010

- Uday Saraiya, MD
- Universal Mobility
- University Health Systems
- University Medical Center
- University Medical Center of Southern Nevada
- University of Nevada School of Medicine
- Walgreens
- Western Regional Center for Brain & Spine, Stuart S. Kaplan M.D.
- Western Regional Spine

Chrysler Corporation LLC Crash Test Reports, Photographs, and/or Videos

- FMVSS 208 VC04674
- FMVSS 208 VC04770
- FMVSS 208 VC05408
- FMVSS 208 VC05939
- IS 16765
- VC 4256
- VC 4321
- VC 4410
- VC 4632
- VC 4674
- VC 4683
- VC 4689
- VC 4716
- VC 4770
- VC 4976
- VC 5069
- VC 5138
- VC 5275
- VC 5408
- VC 5489
- VC 5915
- VC 5939
- VC 6439
- VC 6470
- VC 6476
- VC 6482
- VC Test List Air Bag revised
- XT 202 to XT 216
- XT 277 to XT 281
- XT 285 to XT 292
- XT 296 to XT 301
- XT 457
- XT 465
- XT 466

Other

- Medical records of Shirley Thompson from Innovative Pain Care Center
- CD: CGLLC 000030-CGLLC 001749 and CGLLC 008208-CGLLC 009977
- CD: CGLLC 001750-CGLLC 008194 and CGLLC 009978-CGLLC 011524
- CD: CGLLC 011527

Crash Description

According to the State of Nevada Traffic Accident Report, the subject crash occurred on April 27, 2007, at or around 10:26 a.m. in Clark County, Nevada. Nicole Thompson and Eusebio Villatuya were driving southbound in their respective vehicles on Nellis Boulevard. Ms. Thompson was in center of the three travel lanes, Mr. Villatuya was in the left travel lane, and the right lane was blocked off with cones due to active construction work. As Mr. Villatuya began to make a right turn onto a private drive, the left front portion of Ms. Thompson's 1998 Dodge Neon (the "Neon") struck the right side of Mr. Villatuya's vehicle, a 2000 Mitsubishi Eclipse. The accident report then states that after this initial impact, Ms. Thompson's vehicle continued towards the right side of the road, went over the curb, and collided with a wooden

Thompson v Autoliv

October 28, 2010

power pole. Her vehicle came to rest facing southwest and against the pole. Although the investigating officer, Mr. Jeff Whipple, did not directly observe her in the vehicle, the accident report indicates that Ms. Thompson was a restrained driver. The report further states the driver-side front air bag did not deploy in the crash. Ms. Thompson testified that she was restrained, and after the crash with the pole, she took off her seat belt and looked for her telephone, which was on her lap prior to the accident.

Summary of Medical Records

Las Vegas Fire and Rescue found Nicole Thompson sitting on the ground, alert and oriented, and in mild distress. Per Ms. Thompson's statement to EMS, she was "out for a couple of minutes," but this was not directly observed by responding EMS personnel. Ms. Thompson was ambulatory when she was transported to University Medical Center. At the time of the incident, Ms. Thompson was 19 years old, was 5'4" tall, and weighed 115 pounds.

Upon evaluation in the Emergency Department, Ms. Thompson was noted to have abrasions to the posterior scalp, a 2 cm laceration of the scalp, swelling and abrasions of the lip with a 1 cm left lower lip laceration. There were no neck abrasions or "seat belt" sign marks observed by medical personnel. There was tenderness of the left chest wall and pain over the upper left chest. Her abdomen was normal. There were multiple abrasions of the right hand, including a 2 cm laceration of the dorsum. Bruising of the left hip/thigh and both knees was reported. There was bruising of the right knee with a large amount of subcutaneous swelling.

Ms. Thompson's initial evaluation at University Medical Center noted a Glasgow Coma Score of 15, or entirely normal. She was alert and oriented, answered questions appropriately, was able to move all extremities normally, and had no sensory deficits. During the first few hours of observation, her neurologic status rapidly deteriorated. She became increasingly non-verbal. She developed left-sided gaze with right-sided facial droop (7th nerve palsy). She opened her eyes to command. Within minutes, she was noted to have no purposeful movements of the right upper and right lower extremities (right-sided hemiparesis).

Bilateral carotid arteriograms were then performed on April 27, 2007, revealing dissection with severe stenosis on the left internal carotid artery with poor opacification of the left middle cerebral artery branches and left middle anterior cerebral artery. The right carotid artery study demonstrated pseudoaneurysm in the posterior aspect of the cervical portion of the right internal carotid artery. The radiologist summarized the findings as indicating bilateral carotid artery dissections in the cervical portions, with 99% occlusion on the left and 50% occlusion of the right. Stents were placed in both arteries.

On April 29, 2007, MRI indicated that Ms. Thompson had an acute infarction of the left posterior frontoparietal lobes, left basal ganglia, and left corona radiata. One week following the crash, Ms. Thompson was transferred to a rehabilitation facility. Repeat MRI demonstrated some extension of the previously known left-sided frontal lobe infarct. In the following weeks, Ms. Thompson showed significant improvement. By July 9, 2007, functional cognition and communication skills, as well as higher level cognitive skills (reading, math, memory) were

Thompson v Autoliv

October 28, 2010

judged to be at pre-morbid levels. Mild aphasia was resolved, with minimal residual articular imprecision and oral motor dysfunction.

On July 17, 2007, motor evaluation of Ms. Thompson's right upper extremity revealed: shoulder flexion, abduction, horizontal abduction and adduction at 4/5; elbow flexion and extension 4/5; wrist flexion and extension, supination, and pronation 2-3/5; finger flexion 2/5, and thumb extension 2-/5. Her grip strength was 20 pounds and her pinch strength was 4 pounds. Coordination was minimally impaired for gross motor movements but severely impaired for fine motor coordination. Ms. Thompson's gait was evaluated to be normal.

An extensive evaluation on January 8, 2008 elicited a history of a decrease in reading secondary to concentration difficulties. There were reported to be problems with math and spelling. By March 4, 2008, there was "a vast improvement."

On September 3, 2008, following a normal MRI on March 21, 2008, Ms Thompson had an arthroscopic chondroplasty of the right knee with improvement of pain symptoms.

She was admitted to University Medical Center for two days beginning December 29, 2008 for right sided tingling and numbness, headache and backache, MRI of the brain revealed that the previously seen ischemic changes had, for the most part, resolved. There was a visit to the emergency department for vertigo and right-sided numbness on January 26, 2009. No cause could be determined.

Between January 30 and March 28, 2009 Ms. Thompson had multiple physical therapy visits.

On February 25, 2009, Ms. Thompson reported that, since the accident, she had been suffering from pain across the low back. Examination revealed tenderness to palpation across the lumbosacral joint. An X-ray obtained on March 16, 2009, did not reveal any pathology. EMG testing performed on March 23, 2009, found no evidence for axonal loss or demyelinating sensory or motor peripheral neuropathy from L2 to S1.

On May 28, 2009, Dr. Lemper, a pain specialist, noted a history of low back pain, radiating to the buttocks, right hip and upper thigh. His diagnoses included: Post-traumatic: headaches consistent with cervicogenic cephalgia; neck pain consistent with cervical facet syndrome; right arm paralysis and paresis consistent with cervical radiculopathy; low back pain consistent with facet syndrome; lumbar radiculitis; right hip pain consistent with accelerated DJD; right knee pain consistent with accelerated DJD, status post multiple surgeries; post traumatic myofascial pain with spasm; and multiple CVA status post carotid dissections.

An MRI of the lumbar spine performed on July 2, 2009, was normal except for disc protrusion that abutted the thecal sac at L5-S1. Disc protrusion measurements were neutral 2.4 mm, flexion 2.1 mm and extension 3 mm.

I understand that there have been further medical treatments since July 2009. Some records have only recently been received. Additional records have not yet been produced. I reserve the right to review them on receipt.

Thompson v Autoliv

October 28, 2010

Discussion

We have notes and digital photographs included in our file materials from all of our inspections.

Subject Vehicle Inspection

An inspection of the Neon was performed on June 9, 2008 in Las Vegas, NV. Findings include:

- Starburst fracture pattern approximately 17" measured vertically downward from the top and approximately 16" measured horizontally from the left side of the windshield.
- Rear view mirror with intact glass found completely detached from the front windshield.
- Intact left sun visor mirror. Abrasions on the driver's sun visor plastic.
- Deformation and dislocation of the steering wheel, with right side spokes deformed significantly forward relative to the vehicle.
- Non-deployment of the front air bags.
- Abrasions and deformation on the inboard and outboard lower instrument panel on the driver's side.
- Lack of crash-related witness marks on the left front seat belt.

Exemplar Inspection

An inspection of an exemplar vehicle with a surrogate occupant was performed on April 10, 2009 in Detroit, MI. The driver's seat was adjusted to what was found on the Neon. The surrogate occupant was female, 5'3" tall, and weighed 126 pounds. Measurements and photographs were taken. Among other findings, it was noted that the surrogate was unable to contact the windshield with her right hand when she was seat belted. When 2" of additional webbing was introduced into the shoulder restraint, she was still unable to reach the front windshield with her right hand.

A second exemplar inspection was conducted on October 10, 2010, in Hitchcock, Texas. A surrogate, 5'2 $\frac{3}{4}$ " tall, weighing 123 pounds, was seated in a 1998 2-door, Dodge Neon. The driver's seat was first placed in the position reflected in the photos of Kerry Berg from April 2, 2008. The surrogate then placed the driver's seat into a position of comfort for her. Measurements and photographs were taken. In addition to the normally seated driving position, the surrogate was also placed in a position forward and then a position forward, up and to the right within the confines of the seat belt. The amount of extra webbing needed for these positions is noted in the table below.

Table 1: Belt Positions vs. Occupant Orientation

Occupant Orientation	Latch Plate Position (inches)	Retractor Outlet Trim (inches)
Position of Comfort	28 $\frac{1}{4}$	67
Forward, knees to dash, chin to steering wheel	35 $\frac{1}{4}$	90
Right, up and forward	36 $\frac{1}{2}$	93

In other words, for a properly belted occupant to reach the various forward structures of the vehicle cab within the confines of the seat belt webbing, not only would large amounts of webbing need to be extracted from the retractor, but also, large amounts of webbing would have to pass through the latch plate. This vehicle is equipped with a 2-slot cinching latch plate. Motion of the belt webbing through the latch plate while the occupant loaded the restraint system in a frontal collision would be extremely unlikely. Any motion of this sort would leave marks on the hardware. No such marks are visible on Ms. Thompson's seat belt system.

Furthermore, it was noted that the fully extended shoulder belt webbing impressed the surrogate's shoulder in the forward positions. Thus, assuming a belted occupant could even reach this position, it would be expected that shoulder belt would leave a seat belt mark on the occupant who had been subjected to this force. Ms. Thompson had no such seat belt mark. This is further proof that Ms. Thompson was not belted during this collision.

The surrogate occupant was also placed in both the forward and the rebound positions without the belt. Measurements and photographs were taken. In the rebound position it was noted that the surrogate's upper thighs interacted with the bottom of the steering wheel. This interaction, and not seat belt loading, is most likely what produced the bruising noted on Ms. Thompson's upper legs.

Review of Accident Reconstruction

According to the accident reconstruction of Greg Stephens, there were several impacts involving the Neon. The first impact was a vehicle-to-vehicle sideswipe-type impact between the Neon and the Eclipse. This impact caused a change in speed (ΔV) of the Neon to be approximately 5-10 mph. The principle direction of force (PDOF) was directed primarily longitudinally toward the rear of the Neon, and secondarily laterally to the right of the Neon. As a result of the impact with the Eclipse, the Neon's left front suspension fractured. After the vehicles separated, the Neon's left front dropped to the ground and created gouges in the pavement.

The Neon's right front wheel subsequently impacted and mounted a curb, causing the Neon to pitch nose-up. The Neon's right rear then impacted and mounted the curb. Finally, the Neon collided with a utility pole, with a ΔV of approximately 30 mph and a PDOF of approximately 12 o'clock.

Review of Sled Demonstration

Design Research Engineering conducted a series of sled demonstrations on June 9, 2010. A 5th percentile female dummy was positioned in the driver's seat of a Dodge Neon buck. In the first demonstration, the restrained dummy was subjected to an acceleration pulse consistent with the initial sideswipe collision of Ms. Thompson's crash. In the second demonstration, the retractor was intentionally disabled and the restrained dummy was subjected to a nominal 30 mph frontal impact, similar to Ms. Thompson's pole impact.

Thompson v Autoliv

October 28, 2010

The first demonstration showed the kinematics for a restrained occupant in the sideswipe collision sustained by Ms. Thompson. The dummy is noted to move forward and to the left. There is visible restraining force by the seat belt.

The second demonstration showed the kinematics of a restrained occupant whose seat belt retractor was disabled and did not lock during a pole impact similar to that sustained by Ms. Thompson. In this demonstration, there was webbing extracted from the retractor into the shoulder belt portion of the restraint system. The dummy rotated around the lap belt and the head went downward such that the dummy's face forcibly interacted with the steering wheel.

The sled demonstration further indicates that Ms. Thompson was not belted during this collision. The sled demonstration dummy kinematics are inconsistent with Ms. Thompson's injuries and injury mechanism.

Occupant Kinematics and Injury Mechanism

When not due to penetrating trauma or direct trauma to the neck, the commonly accepted mechanism of carotid artery dissection is an acute hyperextension of the neck causing a longitudinal traction of the carotid artery that can impinge the vessel against the adjacent vertebrae. There is no indication in the medical records of penetrating trauma or direct trauma to Ms. Thompson's neck. Her carotid dissection injury occurred because of hyperextension. Case reports in the medical literature show that it does not take a significant amount of force to cause this injury.

An unrestrained occupant in a frontal impact will move forward relative to the vehicle. There will be no significant motion of the head until the body contacts a surface in front of it. A restrained occupant in a frontal impact will move forward into the seat belt restraint system; as the lower and upper torsos are slowed due to interaction with the restraint system, the head will pivot downwards.

Several locations with witness marks, including but not limited to the lower instrument panel, the steering wheel, the windshield, and the lack of witness marks on the seat belt hardware, indicate that Ms. Thompson underwent a significant amount of forward excursion during this crash, which could not have been possible if she were a restrained occupant. Significant damage to and deformation of the steering wheel indicates that Ms. Thompson's chest contacted the steering wheel in this crash. Ms. Thompson's chest pain and tenderness are confirmation of that contact. Her lack of internal bleeding in the torso is consistent with a diffuse contact rather than a concentrated load. In addition, the abrasions on and deformation to the lower instrument panel are consistent with the abrasion on Ms. Thompson's right knee and bruising on her left knee as a result of lower extremity contact with the lower instrument panel. Ms. Thompson also sustained multiple abrasions and lacerations to her right hand, which are consistent with contact with the windshield at the location of the starburst fracture pattern. Her interaction with the forward portion of the occupant compartment is not consistent with a restrained occupant as evidenced by Chrysler's crash and sled testing.

The subject crash began with an impact between Mr. Villatuya's Mitsubishi and Ms. Thompson's Neon. This initial impact was primarily longitudinal and secondarily lateral. Ms.

Thompson v Autoliv

October 28, 2010

Thompson, within the vehicle, moved mainly forward and slightly to the left in the driver's seat. After the vehicles separated, the Neon experienced a downward pitch due to the fractured left front suspension, causing Ms. Thompson to have an upward motion relative to the vehicle. She was then positioned with her chin approximately over the steering wheel rim. The collision ultimately caused her vehicle to travel towards the right side of the roadway.

An additional impact then occurred when the Neon's right front wheel struck the curb. The curb impact slowed her vehicle and pitched it upward. Ms. Thompson's motion as a result of the curb impact was further forward. The upward pitch of the vehicle brought the steering wheel rim upwards into Ms. Thompson's chin. The contact between the steering wheel rim and her chin caused a very rapid rearward rotation of Ms. Thompson's head, hyperextending it and causing her bilateral carotid artery dissection.

The final impact occurred when the Neon collided with a utility pole. Ms. Thompson was out of position just prior to and at the time of the pole impact. The impact with the utility pole caused Ms. Thompson to continue to move forward relative to the vehicle. Her chest was already in contact with, or nearly in contact with the steering wheel before this impact. The contact of her chest with the steering wheel allowed her to ride down the pole impact without serious internal injuries to her torso. Her knees impacted the knee bolster as a result of the pole impact, causing her knee injuries. Bruising to her hips and thighs could have occurred with this impact to the pole or could have occurred as a result of the lateral forces from the initial impact with the Mitsubishi. There was also some downward pitch to the vehicle during the pole impact. This would bring the sunvisor or roof into the top of Ms. Thompson's head, causing the laceration/abrasion there. Based on the occupant kinematics seen in VC4716, it is likely that this would result in the top of Ms. Thompson's head striking the sunvisor or roof on rebound.

According to the exemplar inspection, Ms. Thompson's knees would have been approximately 7 $\frac{1}{4}$ " to 8 $\frac{1}{4}$ " from the knee bolster prior to the collision. She would have had to traverse this distance and more to cause the significant damage to the knee bolster including the deformation, abrasions and marks on the panel. It is not possible for a belted occupant to cause this amount of damage to the knee bolster in this severe of a collision.

Injury Risk

To protect an occupant in frontal collisions, use of seat belt restraint systems and air bags have been shown to significantly reduce head injuries. Air bag effectiveness depends upon the proper use of seat belt restraint systems, which will limit the amount of forward excursion to an occupant prior to interaction with the air bag. Occupants who are unrestrained can sustain serious injuries if they are in close proximity to the air bag when it deploys. The proximity to the air bag increases both the frequency and severity of injury. In NHTSA's Fifth/Sixth Report to Congress on occupant protection systems, the estimated effectiveness of reducing the likelihood of serious-to-greater (MAIS 3+) injuries in frontal crashes is 80% when a lap-shoulder belt is worn (with or without air bag deployment) but only 49% when an air bag alone is used.

The claim that a non-deployed air bag caused or contributed to Ms. Thompson's injuries is flawed. Prior to the advent of air bags and in research comparing belted to non-belted modalities, occupants in frontal crashes were noted to have gained substantial injury risk

reduction when properly belted compared to being unbelted. The seat belt itself (not the air bag) offers the primary source of injury risk reduction. A seat belt is a *primary* restraint. An air bag is a *secondary* restraint, designed to enhance the benefits of seat belts alone.

Air bags have a context that is crucial to the understanding of when an air bag *should* deploy, and when an air bag *should not* be deployed. The point-of-view that, if an air bag exists in a vehicle, it should deploy in every accident, lacks sufficient context and ignores the risks involved with deployment where an occupant is out of position.

In contrast to properly belted occupants, occupants who are out-of-position (OOP) are at higher risk of injury from an air bag deployment since their position brings them closer to the air bag cover and inflating air bag itself. Air bags require time and space to deploy properly and offer effective restraint. There are certain crash types that involve multiple impacts in which it would be dangerous for an air bag to deploy. In those cases where the occupant has already moved in close proximity with the air bag, the deploying air bag increases risk of severe and fatal injuries, particularly to the heart, aorta, and the neck.

Were Ms. Thompson's air bag to have deployed in this subject accident, she would have been out-of-position, putting her at increased risk for serious and potentially fatal injuries. Not only is there no substantiation of the idea that an airbag deployment would have prevented a hyperextension neck injury, but the air bag itself, had it deployed, would likely have caused serious to fatal injuries to Ms. Thompson because she would have been out of position when it deployed. Case reports and NHTSA investigations have demonstrated the serious injury potential of air bag deployments to out of position occupants.

Primary Opinions

1. Ms. Thompson was unrestrained at the time of the crash.
2. Ms. Thompson was out-of-position and forward in the compartment as a result of being unrestrained and the initial impact with the Mitsubishi.
3. Ms. Thompson's bilateral carotid injuries were the result of hyperextension of the head and neck when the steering wheel interacted with her chin at the time of the Neon's right front wheel impact with the curb.
4. Had Ms. Thompson been properly restrained at the time of the crash, her risk of severe injury (AIS 4) would have been significantly reduced or eliminated.
5. Had the driver's front air bag deployed when the Neon struck the utility pole, Ms. Thompson would have been more seriously injured because she was out-of-position and too close to the air bag at the time of the pole impact.

Please note that this report is based upon information available to me at the time of its preparation. Should substantial additional information that affects the contents of this report become available, an amended or supplementary report may be prepared. I will also address any plaintiff expert opinions as they become available. I anticipate this may involve additional work including exemplar inspections and testing.

Thompson v Autoliv

October 28, 2010

If you have any questions do not hesitate to contact me.

Sincerely,



Elizabeth H. Raphael, M.D., F.A.C.E.P.

Thompson v Autoliv

October 28, 2010

Bibliography

Air Bag

1. Crandall, J. R.; Duma, S. M.; Bass, C. R.; Pilkey, W.D.; Kuppa, S.M.; Khaewpong, N., and Eppinger, R. "Thoracic Response and Trauma of Out-of-Position Drivers Resulting From Air Bag Deployment," 41st AAAM Proceedings, 1997.
2. Dalnitas, D.J.; Hurley, R.M., and German, A. "Supplemental Restraint Systems: Friend or Foe to Belted Occupants?," 40th AAAM Proceedings, 1996.
3. DeLeonardis, D.M.; Ferguson, S.A., and Pantula, J.F. "Survey of Driver Seating Positions in Relation to the Steering Wheel," SAE Paper No. 980642, 1998.
4. Digges, K.; Noureddine, A., and Bedewi, N.E. "Chest Injury Risks to Drivers for Alternative Air Bag Inflation Rates," SAE Paper No. 970129, 1997.
5. Dischinger, P.C.; Ho, S.M.; Kerns, T.J., and Brennan, P. "Patterns of Injury in Frontal Collisions With and Without Airbags," 1996 IRCOB Proceedings, 1996.
6. "Evaluation of the Effectiveness of Occupant Protection: Interim Report," NHTSA, 1992.
7. "Fifth/Sixth Report to Congress: Effectiveness of Occupant Protection Systems and Their Use," NHTSA Report No. DOT HS 809 442, 2001.
8. "Fourth Report to Congress: Effectiveness of Occupant Protection Systems and Their Use," NHTSA Report No. DOT HS 808 919, 1999.
9. German, A.D.; Dainius J., and Hurley, R.M. "Air Bag Collision Performance in a Restrained Occupant Population," 16th International Technical Conference on the Enhanced Safety of Vehicles, 1998.
10. Happer, A.J.; Hughes, M.C.; Simconovic, G.P.; Moss, R.T.; Bardas, A.M., and Bochme, S.M. "Occupant Displacement Model for Restrained Adults in Vehicle Frontal Impacts," SAE Paper No. 2004-01-1198, 2004.
11. Huelke, D., "An Overview of Air Bag Deployments and Related Injuries. Case Studies and A Review of the Literature," SAE Paper No. 950866, 1995.
12. Huere, J.F.; Foret-Bruno, J.Y.; Faverjon, G., and Le Coz, J.Y. "Airbag Efficiency in Frontal Real World Accidents," 17th International Technical Conference on the Enhanced Safety of Vehicles, 2001.
13. Kleinberger, M. and Summers, L. "Mechanisms of Injuries for Adults and Children Resulting From Airbag Interaction," 41st AAAM Proceedings, 1997.
14. Lebarbé, M., Potier, P.; Baudrit, P.; Petit, P.; Trosseille, X., and Vallancien, G. "Thoracic Injury Investigation Using PMHS in Frontal Airbag Out-of-Position Situations," Stapp Car Crash J, 49, 2005.
15. Malczyk, A. and Adomeit, H.D. "The Airbag Folding Pattern as a Means for Injury Reduction of Out-of-Position Occupants," SAE Paper No. 952704, 1995.
16. Malczyk, A.; Franke, D., and Adomeit, H.D. "Dual-State Inflators and OoP Occupants – A Performance Study," SAE Paper No. 982325, 1998.
17. Maxeiner, H. and Micheal, H. "Airbag-induced Lethal Cervical Trauma," J Trauma, 42(6), 1997.

Thompson v Autoliv

October 28, 2010

18. McGovern, M.K.; Murphy, R.X. Jr.; Okunski, W.J., and Wasser T.E. "The Influence of Air Bags and Restraining Devices on Extremity Injuries in Motor Vehicle Collisions," *Ann Plast Surg*, 44(5), 2000.
19. McGwin, G. Jr.; Metzger, J.; Alonso, J. E., and Rue, L.W. III. "The Association Between Occupant Restraint Systems and Risk of Injury in Frontal Motor Vehicle Collisions," *J Trauma*, 54(6), 2003.
20. Mertz, H.J.; Williamson, J.E., and Vander Lugt, D.A. "The Effect of Limiting Shoulder Belt Load with Air Bag Restraint," SAE Paper No. 950886, 1995.
21. Mohamed, A.A. and Banerjee, A. "Patterns of Injury Associated with Automobile Airbag Use," *Postgrad Med J*, 74(874), 1998.
22. Morris, R.A.; Duma, S.A.; Bass, C.R.; Sieveka, E.M.; Pelletiere, J.A.; Crandall, J.R., and Pilkey, W.D. "Analysis of Humerus Orientation in Upper Extremity Experiments with a Deploying Airbag," SAE Paper No. 980639, 1998.
23. Nusholtz, G.S.; Xu, L.; Mosier, R.G.; Kostyniuk, G.W., and Patwa, P.D. "Estimation of OoP from Conditional Probabilities of Airbag Fire-Times and Vehicle Response," 16th International Technical Conference on the Enhanced Safety of Vehicles, 1998.
24. O'Neill, B. "Effectiveness of Air Bags," *New Engl J Med*, 326(16), 1992.
25. Roychoudhury, R.; Sun, D.; Hamid, M., and Hanson, C. "5th Percentile Driver Out of Position Computer Simulation," SAE Paper No. 2000-01-1006, 2000.
26. "Second Report to Congress: Effectiveness of Occupant Protection Systems and Their Use," NHTSA, 1996.
27. Sutyak, J.P.; Passi, V., and Hammond, J.S. "Air Bags Alone Compared with the Combination of Mechanical Restraints and Air Bags: Implications for the Emergency Evaluation of Crash Victims," *South Med J*, 90(9), 1997.
28. "Third Report to Congress: Effectiveness of Occupant Protection Systems and Their Use," NHTSA, <http://www.nhtsa.dot.gov/people/injury/airbags/208con2e.html>, 1996.
29. Wallis, L.A. and Greaves, I. "Injuries Associated with Airbag Deployment," *Emerg Med J*, 19, 2002.

Injury Risk

1. Bass, C.R., Crandall, J.R., Pilkey, W.D. "Out-of-Position Occupant Testing (OOPS3 Series)" University of Virginia Automobile Safety Laboratory, September 1998.
2. Crandall, J.R., Bass, C.R., and Duma, S.M. "Evaluation of 5th Percentile Female Hybrid III Thoracic Biostidelity during Out-of-Position Tests with a Driver Air Bag," SAE Paper No. 980636, 1998.
3. Cromack JR, Schneider D, Blaisdell D. "Occupant Kinematics & Belt Markings in Crash Tests with Unrestrained and Partially Restrained Test Dummies," 34th Annual AAAM Conference Proceedings, 1990.
4. "Federal Motor Vehicle Safety Standards; Occupant Crash Protection; Proposed Rule." Federal Register 64:214, Parts 552, 571, 585, and 595. Nov. 5, 1999.
5. "Fifth/Sixth Report to Congress: Effectiveness of Occupant Protection Systems and Their Use," NHTSA Report No. DOT HS 809 442, 2001.

Thompson v Autoliv

October 28, 2010

6. Gennarelli TA, Wodzin E, editors. AIS 2005. Barrington, IL: Association for the Advancement of Automotive Medicine; 2005.
7. "Guidelines for evaluating out-of-position vehicle occupant interactions with deploying frontal airbags," SAE Information Report J1980, Society of Automotive Engineers, Inc.: Warrendale, PA., 2001.
8. Horsch, J et al. "Assessment of Air Bag Deployment Loads" SAE paper 902324, 1990.
9. Kuppa S, Wang J, Haffner M, Eppinger R. "Lower Extremity Injuries and Associated Injury Criteria," SAE Paper No. 2001-06-0160, 2001.
10. Malliaris AC, Hitchcock R, Hansen M. "Harm Causation and Ranking in Car Crashes," SAE Paper No. 850090, 1985.
11. Malliaris A, Digges K, DeBlois, J. "Relationships Between Crash Casualties and Crash Attributes," SAE Paper No. 970393, 1997.
12. Melvin, J.W., et al. "Assessment of Air Bag Deployment Loads with the Small Female Hybrid III Dummy," SAE Paper No. 933119, 1993.
13. Mills PJ, Hobbs CA. "The Probability of Injury to Car Occupants in Frontal and Side Impacts," SAE Paper No. 841652, 1984.
14. Morris, C.R., Zuby, D.S., and Lund, A.K. "Measuring Airbag Injury Risk to Out-of-Position Occupants." Proceedings of the 16th ESV, Paper No. 98-S5-O-08, pg. 1036-1043, 1998.
15. National Highway Traffic Safety Administration. "Special Crash Investigations — Counts of frontal air bag related fatalities and seriously injured persons." Washington, DC: US Department of Transportation, 2008.
16. National Highway Traffic Safety Administration. "Special Crash Investigations — Counts of frontal air bag related fatalities and seriously injured persons." Report no. DOT HS-811-104. Washington, DC: US Department of Transportation, 2009.
17. Otte D, Sudkamp N. "Variations of Injury Patterns of Seat-Belt Users," SAE Paper No. 870226, 1987.
18. Otte D. "Change in Injury Situation for Belted Front-Seat Car Passengers in the Course of Development in Vehicle Construction," SAE Paper No. 881718, 1988.
19. Otte D. "The Accident Research Unit Hannover as Example for Importance and Benefit of Existing In Depth Investigations," SAE Paper No. 940712, 1994.
20. Padmanaban J, Davis MS. "Re-Evaluation of Rear Seat Restraint System Effectiveness in Preventing Fatalities, Using Recent Fatal Accident Data," Proc. 43rd Conf., AAAM, Barcelona, Spain, September 1999.
21. Roberts VL, Compton CP. "The Relationship Between Delta V and Injury," SAE Paper No. 933111, 1993.

Seat Belt

1. Bready, J.E.; Nordhagen, R.P.; Kent, R.W., and Jakstis, M.W. "Characteristics of Seat Belt Restraint System Markings," SAE Paper No. 2000-01-1317, 2000.

Thompson v Autoliv

October 28, 2010

2. Dalmotas, D.J. "Mechanisms of Injury to Vehicle Occupants Restrained by Three-Point Seat Belts," SAE Paper No. 801311, 1980.
3. Huelke, D.F.; Lawson, T.E.; Scott, R., and Marsh, J.C. "The Effectiveness of Belt Systems in Frontal and Rollover Crashes," SAE Paper No. 770148, 1977.
4. Hayes, C.W.; Conway, W.F.; Walsh, J.W.; Coppage, L., and Gervin A.S. "Seat Belt Injuries: Radiologic Findings and Clinical Correlation," Radiographics, 11(1), 1991.
5. Malliaris, A.; Digges, K., and DeBlois, J. "Relationships between Crash Casualties and Crash Attributes," SAE Paper No. 970393, 1997.
6. McLellan, B. A., Rizoli, S. B., Brenneman, F. D.; Boulanger, B.R.; Sharkey, P.W., and Szalai J.P. "Injury Pattern and Severity in Lateral Motor Vehicle Collisions: a Canadian Experience," J Trauma, 41(4), 1996.
7. Raphael, E.; Piziali, R.; Le, H.; Hinger, J.E.; Cooper, E., and Croteau, J. "Physical Evidence Associated with Seatbelt Entanglement During a Collision," SAE Paper No. 2007-01-1501, 2007.
8. Siegel, J.H.; Mason-Gonzalez, S.; Dischinger, P.; Cushing, B.; Read, K.; Robinson, R.; Smialek, J.; Heatfield, B.; Hill, W., and Bents, F. "Safety Belt Restraints and Compartment Intrusions in Frontal and Lateral Motor Vehicle Crashes: Mechanisms of Injuries, Complications, and Acute Care Costs," J Trauma, 34(5), 1993.
9. Toomey, D.E.; Van Ee, C.A., and Klima, M. "Safety Restraint System Physical Evidence and Biomechanical Injury Potential Due to Belt Entanglement," SAE Paper No. 2006-01-1670, 2006.
10. Toomey, D.E., Klima, M.E., and Cooper, E.R. "Evaluation of Seat Belt Assembly Physical Evidence in Properly Functioning and Intentionally Disabled Retractor Demonstrations," SAE Paper No. 2009-01-1245, 2009.
11. Yoganandan, N.; Pintar, F.A.; Gennarelli, T.A., and Maltese, M.R. "Patterns of Abdominal Injuries in Frontal and Side Impacts," 44th AAAM Proceedings, 2000.

Carotid Artery Dissection

1. "Abbreviated Injury Scale 2005," AAAM. Gennarelli, T.A., Wodzin, E., editors. Des Plaines, IL, 2005.
2. An, T.L. "Fatal Dissecting Aneurysm of the Internal Carotid Artery with Delayed Symptoms Following Facial Impact," J Forensic Sci, 37(2), 1992.
3. Batzdorf, U.; Benton, J.R., and Machleder, H.I. "Blunt Trauma to the High Cervical Carotid Artery," Neurosurgery, 5(2), 1979.
4. Beatty, R.A. "Dissecting Hematoma of the Internal Carotid Artery Following Chiropractic Cervical Manipulation," J Trauma, 17(3), 1977.
5. Benito, M.C.; Garcia, F.; Fernandez-Quero, L.; Lajara, A.; Jardon, E.; Frias, I., and Manzanos, A. "Lesion of the Internal Carotid Artery Caused by a Car Safety Belt," J Trauma, 30(1), 1990.
6. Benninger, D.H.; Georgiadis, D.; Kremer, C.; Studer, A.; Nedeltchev, K., and Baumgartner, R.W. "Mechanism of Ischemic Infarct in Spontaneous Carotid Dissection," Stroke, 35(2), 2004.

7. Berlot, G.; Nicolazzi, G.; Viviani, M.; Silvestri, L.; Tomasini, A.; Gullo, A.; Cioffi, V., and Bussani R. "Traumatic Blunt Carotid Injury: Clinical Experience and Review of the Literature," *Eur J Emerg Med*, 3(1), 1996.
8. Biffl, W.L.; Moore, E.E.; Ryu, R.K.; Offner, P.J.; Novak, Z.; Coldwell, D.M.; Franciose, R.J., and Burch, J.M. "The Unrecognized Epidemic of Blunt Carotid Arterial Injuries: Early Diagnosis Improves Neurologic Outcome," *Ann Surg*, 228(4), 1998.
9. Caplan, L.R.; Zarins, C.K., and Hemmati, M. "Spontaneous Dissection of the Extracranial Vertebral Arteries," *Stroke*, 16(6), 1985.
10. Chedid, M.K.; Deeb, Z.L.; Rothfus, W.E.; Abla, A.A.; Sherman, R.L., and Maroon, J.C. "Major Cerebral Vessels Injury Caused by a Seatbelt Shoulder Strap: Case Report," *J Trauma*, 29(11), 1989.
11. Clarke, P. and Whittaker, M. "Traumatic Aneurysm of the Internal Carotid Artery and Rupture of the Duodenum Following Seat Belt Injury," *Injury*, 12, 1980.
12. Cogbill, T.H.; Moore, E.E.; Meissner, M.; Fischer, R.P.; Hoyt, D.B.; Morris, J.A.; Shackford, S.R.; Wallace, J.R.; Ross, S.E.; Ochsner, M.G., and Sugerman, H.J. "The Spectrum of Blunt Injury to the Carotid Artery: A Multicenter Perspective," *J Trauma*, 37(3), 1994.
13. Colley, D.P. and Clark R.A. "Acute Traumatic Pseudo Aneurysm of The Proximal Left Common Carotid Artery: A Case Report," *Radiology*, 134(2), 1980.
14. D'Anglejan-Chatillon, J.; Ribeiro, V.; Mas, J.L.; Youl, B.D., and Bousser, M.G. "Migraine – A Risk Factor for Dissection of Cervical Arteries," *Headache*, 29(9), 1989.
15. Davis, J.M. and Zimmerman, R.A. "Injury of the Carotid and Vertebral Arteries," *Neuroradiology*, 25(2), 1983.
16. DiPerna, C.A.; Rowe, V.L.; Terramani, T.T.; Salim, A.; Hood, D.; Velmahos, G.C., and Weaver A.L. "Clinical Importance of the 'Seat Belt Sign' in Blunt Trauma to the Neck," *Am Surg*, 68(5), 2002.
17. Duncan, M.A.; Dowd, N.; Rawluk, D., and Cunningham, A.J. "Traumatic Bilateral Internal Carotid Artery Dissection Following Airbag Deployment in a Patient with Fibromuscular Dysplasia," *Br J Anaesth*, 85(3), 2000.
18. Eachempati, S. R.; Sebastian, M.W., and Lawrence, R.R. II. "Posttraumatic Bilateral Carotid Artery and Right Vertebral Artery Dissections in a Patient with Fibromuscular Dysplasia: Case Report and Review of the Literature," *J Trauma*, 44(2), 1998.
19. Ernst, A.; Robertson, H.J.; Bercier, M.L., and Kline D.G. "Occult Carotid Artery Injury Related To Automobile Seat Belts," *Ann Emerg Med*, 17(10), 1988.
20. Fabian, T.C.; Patton, J.H. Jr.; Croce, M.A.; Minard, G.; Kudsk, K.A., and Pritchard, F.E. "Blunt Carotid Injury: Importance of Early Diagnosis and Anticoagulant Therapy," *Ann Surg*, 223(5), 1996.
21. Fakhry, S.M.; Jaques, P.F., and Proctor, H.J. "Cervical Vessel Injury After Blunt Trauma," *J Vasc Surg*, 8(4), 1988.
22. Gayzik, F.S.; Bostrom, O.; Örtenwall, P.; Duma, S.M., and Stitzel, J.D. "An Experimental and Computational Study of Blunt Carotid Artery Injury," *50th AAAM Proceedings*, 2006.
23. Gollub, M.J.; Friedwald, J.P., and Hartigan, M. "Iatrogenic Dissection of the Common Carotid Artery: Diagnosis by Dynamic Image and Color Flow Doppler Ultrasonography," *J Clin Ultrasound*, 19(4), 1991.

Thompson v Autoliv

October 28, 2010

24. Gould, D.B. and Cunningham, K. "Internal Carotid Artery Dissection After Remote Surgery. Iatrogenic Complications of Anesthesia," *Stroke*, 25(6), 1994.
25. Guillon, B.; Lévy, C., and Bousser, M.G. "Internal Carotid Artery Dissection: An Update," *J Neurol Sci*, 153(2), 1998.
26. Haneline, M.T. and Lewkovich, G.N. "An Analysis of the Etiology of Cervical Artery Dissections: 1994 to 2003," *J Manipulative Physiol Ther*, 28(8), 2005.
27. Haneline, M. and Triano, J. "Cervical Artery Dissection. A Comparison of Highly Dynamic Mechanisms: Manipulation Versus Motor Vehicle Collision," *J Manipulative Physiol Ther*, 28(1), 2005.
28. Haneline, M.T. and Rosner, A.L. "The Etiology of Cervical Artery Dissection," *J Chiropr Med*, 6(3), 2007.
29. Hayes, C.W.; Conway, W.F.; Walsh, J.W.; Coppage, L., and Gervin A.S. "Seat Belt Injuries: Radiologic Findings and Clinical Correlation," *Radiographics*, 11(1), 1991.
30. Hellner, D.; Thie, A.; Lachenmayer, L.; Janzen, R.W., and Schmeizle, R. "Blunt Trauma Lesions of the Extracranial Internal Carotid Artery in Patients with Head Injury," *J Craniomaxillofac Surg*, 21(6), 1993.
31. Janjua, K.J.; Goswami, V., and Sagar, G. "Whiplash Injury Associated with Acute Bilateral Internal Carotid Artery Dissection," *J Trauma*, 40(3), 1996.
32. Karacagil, S.; Hårdemark, H.G., and Bergqvist, D. "Spontaneous Internal Carotid Artery Dissection. Review," *Int Angiol*, 15(4), 1996.
33. Kerwin, A.J.; Bynoe, R.P.; Murray, J.; Hudson, E.R.; Close, T.P.; Gifford, R.R.; Carson, K.W.; Smith, L.P., and Bell, R.M. "Liberalized Screening for Blunt Carotid and Vertebral Artery Injuries is Justified," *J Trauma*, 51(2), 2001.
34. Kraus, R.R.; Bergstein, J.M., and DeBord J.R. "Diagnosis, Treatment, and Outcome of Blunt Carotid Arterial Injuries," *Am J Surg*, 178, 1999.
35. Laitt, R.D.; Lewis, T.T., and Bradshaw, J.R. "Blunt Carotid Arterial Trauma," *Clin Radiol*, 51(2), 1996.
36. Li, M.S.; Smith, B.M.; Espinosa, J.; Brown, R.A.; Richardson, P., and Ford, R. "Nonpenetrating Trauma to the Carotid Artery: Seven Cases and a Literature Review," *J Trauma*, 36(2), 1994.
37. Lin, P.H.; Bush, R.L., and Lumsden, A.B. "Traumatic Aortic Pseudoaneurysm after Airbag Deployment: Successful Treatment with Endoluminal Stent-Graft Placement and Subclavian-to-Carotid Transposition," *J Trauma*, 58, 2005.
38. Liu, J.S.; Tsai, T.C., and Chang, Y.Y. "Extracranial Internal Carotid Artery Dissection Secondary to Neck Massage: Visualization of Mural Hematoma by MRI," *Kaohsiung J Med Sci*, 9(5), 1993.
39. Mas, J.L.; Goeau, C.; Bousser, M.G.; Chiras, J.; Verret, J.M., and Toublou, P.J. "Spontaneous Dissecting Aneurysms of the Internal Carotid and Vertebral Arteries – Two Case Reports," *Stroke*, 16(1), 1985.
40. Mason, D.P.; Orgill, D.P.; Schoen, F.J., and Rizzo, R.J. "Traumatic Carotid Artery Dissection of Restrained Driver and Thoracic Aorta Transection of Unrestrained Passenger in a Motor Vehicle Accident: Case Report," *J Trauma*, 43(3), 1997.
41. Matsuura, J.H.; Rosenthal, D.; Jerius, H.; Clark, M.D., and Owens, D.S. "Traumatic Carotid Artery Dissection and Pseudoaneurysm Treated with Endovascular Coils and Stent," *J Endovasc Surg*, 4(4), 1997.

42. Mayberry, J.C.; Brown, C.V.; Mullins, R.J., and Velmahos, G.C. "Blunt Carotid Artery Injury: The Futility of Aggressive Screening and Diagnosis," *Arch Surg*, 139(6), 2004.
43. McNab, A.A.; Fabinyi, G.C., and Milne, P.Y. "Blunt Trauma to the Carotid Artery," *Aust N Z J Surg*, 58(8), 1988.
44. Mears, G.D. and Leonard, R.B. "Blunt Carotid Artery Trauma: A Case Report," *J Emerg Med*, 6(4), 1988.
45. Mokri, B.; Piepgras, D.G., and Houser, O.W. "Traumatic Dissections of the Extracranial Internal Carotid Artery," *J Neurosurg*, 68(2), 1988.
46. Mokri, B.; Sundt, T.M. Jr.; Houser, O.W., and Piepgras, D.G. "Spontaneous Dissection of the Cervical Internal Carotid Artery," *Ann Neurol*, 19(2), 1986.
47. Nunnink, L. "Blunt Carotid Artery Injury," *Emerg Med*, 14(4), 2002.
48. O'Sullivan, R.M.; Graeb, D.A.; Nugent, R.A.; Robertson W.D., and Lapointe, J.S. "Carotid and Vertebral Artery Trauma: Clinical and Angiographic Features," *Australas Radial*, 35, 1991.
49. Opeskin K. "Traumatic Carotid Artery Dissection," *Am J Forensic Med Path* 01, 8(3), 1997.
50. Parikh, A.A.; Luchette, F.A.; Valente, J.F.; Johnson, R.C.; Anderson, G.L.; Blebeau, J.B.; Rosenthal, G.J.; Hurst, J.M.; Johannigman, J.A., and Davis, K. Jr. "Blunt Carotid Artery Injuries," *J Am Coll Surg*, 185(1), 1997.
51. Patel, N.N. and Wang, S.C. "Carotid and Vertebral Artery Dissection Due to Deceleration Injury in a Motor Vehicle Crash," *J Trauma*, 51(4), 2001.
52. Perez-Cruet, M.J.; Patwardhan, R.V.; Mawad, M.E., and Rose, J. "Treatment of Dissecting Pseudoaneurysm of the Cervical Internal Carotid Artery Using a Wall Stent and Detachable Coils: Case Report," *Neurosurgery*, 40(3), 1997.
53. Pica, R.A.; Rockwell, B.H.; Raji, M.R.; Dastur, K.J., and Berkey, K.E. "Traumatic Internal Carotid Artery Dissection Presenting as Delayed Hemilingual Paresis," *AJNR Am J Neuroradiol*, 17(1), 1996.
54. Pittock, S.J.; Moroney, J.T.; Alexander, M.; Brennan, P., and Moorhouse, D. "Traumatic Bilateral Carotid Dissection with Concomitant Cerebral Infarction," *J Emerg Med*, 20(1), 2001.
55. Prabhakar, S.; Bhatia, R.; Khandelwal, N.; Lal, V., and Das C.P. "Vertebral Artery Dissection Due to Indirect Neck Trauma: An Underrecognised Entity," *Neurol India*, 49(4), 2001.
56. Reddy, K.; Furer, M.; West, M., and Harmonic, M. "Carotid Artery Dissection Secondary to Seatbelt Trauma: Case Report," *J Trauma*, 30(5), 1990.
57. Rhodes, R.H.; Phillips, S.; Booth, F.A., and Magnus, K.G. "Dissecting Hematoma of Intracranial Internal Carotid Artery in an 8-year-old Girl," *Can J Neurol Sci*, 28, 2001.
58. Rozycki, G.S.; Tremblay, L.; Feliciano, D.V.; Tchorz, K.; Hattaway, A.; Fountain, J., and Pettitt, B.J. "A Prospective Study for the Detection of Vascular Injury in Adult and Pediatric Patients with Cervicothoracic Seal Belt Signs," *J Trauma*, 52(4), 2002.
59. Saletta, J.D.; Folk, F.A., and Freekark, R.J. "Trauma to the Neck Region," *Surg Clin North Am*, 53(1), 1973.
60. Sances, A. Jr.; Carlin, F.H.; Daniels, D., and Cusick, J.F. "Biomechanics of Carotid Artery Dissection in Vehicular Accidents," *ASME Publications – Adv Bioeng*, 48, 2000.

Thompson v Autoliv

October 28, 2010

61. Sanzone, A.G.; Torres, H., and Doundoulakis, S.H. "Blunt Trauma to the Carotid Arteries," *Am J Emerg Med*, 13(3), 1995.
62. Schievink, W.I. "Spontaneous Dissection of the Carotid and Vertebral Arteries," *N Eng J Med*, 344(12), 2001.
63. Schievink, W.I.; Atkinson, J.L.; Bartleson, J.D., and Whisnant, J.P. "Traumatic Internal Carotid Artery Dissections Caused By Blunt Softball Injuries," *Am J Emerg Med*, 16(2), 1998.
64. Smith, J.K. and Castillo, M. "Carotid Sinus Syndrome Secondary to Iatrogenic Dissection of the Carotid Artery," *AJNR Am J Neuroradiol*, 15(1), 1994.
65. Stapf, C.; Elkind, M.S.V., and Mohr, J.P. "Carotid Artery Dissection," *Annu Rev Med*, 51, 2000.
66. Steinmetz, H.; Heiss, E., and Mironov, A. "Traumatic Giant Aneurysms of the Intracranial Carotid Artery Presenting Long After Head Injury," *Surg Neurol*, 30(4), 1988.
67. Stonebridge, P.A.; Clason, A.E., and Jenkins, A.M. "Traumatic Aneurysm of the Extracranial Internal Carotid Artery Due to Hyperextension of the Neck," *Eur J Vasc Surg*, 4(4), 1990.
68. Storrow, A.B. and Smith, B.A. "Traumatic Bilateral Carotid Dissection," *J Emerg Med*, 13(2), 1995.
69. Stringer, W.L. and Kelly, D.L. Jr. "Traumatic Dissection of the Extracranial Internal Carotid Artery," *Neurosurgery*, 6(2), 1980.
70. Touzé, E.; Gauvrit, J.Y.; Moulin, T.; Meder, J.F.; Bracard, S., and Mas, J.L. "Risk of Stroke and Recurrent Dissection After a Cervical Artery Dissection: A Multicenter Study," *Neurology*, 61(10), 2003.
71. Tzourio, C.; Benslamia, L.; Guillon, B.; Aïdi, S.; Bertrand, M.; Berthet, K.; and Bousser, M.G. "Migraine and the Risk of Cervical Artery Dissection: A Case-Control Study," *Neurology*, 59(3), 2002.
72. Weimann, S.; Rumpl, E., and Flora, G. "Carotid Occlusion Caused by Seat Belt Trauma. Case Report," *Eur J Vasc Surg*, 2(3), 1988.
73. Zelenock, G.B.; Kazmers, A.; Whitehouse, W.M. Jr.; Graham, L.M.; Erlandson, E.E.; Cronenwett, J.L.; Lindenauer, S.M., and Stanley, J.C. "Extracranial Internal Carotid Artery Dissections: Noniatrogenic Traumatic Lesions," *Arch Surg*, 117(4), 1982.
74. Zetterling, M.; Carlström, C., and Konrad, P. "Internal Carotid Artery Dissection," *Acta Neurol Scand*, 101(1), 2000.
75. Zhou, W.; Huynh, T.T.; Kougias, P.; El Sayed, H.F., and Lin, P.H. "Traumatic Carotid Artery Dissection Caused by Bungee Jumping," *J Vasc Surg*, 46(5), 2007.